0120/031/004
1934
H

MANITOBA DEPARTMENT OF AGRICULTURE AND IMMIGRATION
WINNIPEG, CANADA

LIBRARY, ALBERTA AGRICULTU
7000 - 113 STREET, EDMONTON
ALBERTA, CANADA T6H 5

ANNUAL FORAGE CROPS

With Special Consideration to Drought Endurance

HARVESTING CORN

R. WHITEMAN, B.S.A., M.Sc.
Extension Service
Department of Agriculture
WINNIPEG, MAN.

By Authority of Hon. D. G. McKenzie, Minister of Agriculture and Immigration

Annual Forage Crops
FOR MANITOBA

INTRODUCTION

When periods of crop failure come, and when these each extend over two or three consecutive years, some feature must be included in the system of farming that will insure some income to tide the farmer over the trying period.

The farmer has before him not only the problem of providing adequate food supplies for the current year, but also the need for a reserve supply to help carry over those dry years, which occur more or less frequently, when the summer is so dry and hot that crops are an utter failure.

In this circular special attention will be paid to those crops that are suited to our comparatively short seasons, and which are considered more or less drought resistant.

The forage crops best suited to those areas where evaporation is high belong to the annual type. These are seeded each year, and can be planted on summerfallowed land when the necessity arises. Their ability to adjust themselves to drought conditions should warrant the serious consideration of any farmer with livestock to feed. Under average moisture conditions they can be seeded on fall or spring plowed land with a fair assurance of success.

CLIMATE AND CROPS

The average rainfall at Winnipeg from 1917 to 1932, inclusive, was 18.27 inches, the lowest recorded being 12.37 inches, and the highest 23.70 inches. This includes snowfall at ten inches equal to one inch of rainfall. A great part of the moisture from snow is lost during early spring thaws, while the ground is still frozen and cannot absorb it. Crops, therefore, must depend on moisture that has been stored in the soil by proper summerfallow methods and the rain which falls during the months of May, June and July. If rainfall is light during this period, crops will suffer and low yields will result.

On the open plains, where trees are not present in any great number, the hot, dry winds tend to draw enormous quantities of moisture from the soil. At the Dry Lands Field Station at Ardmore, South Dakota, the average precipitation for the years 1912 to 1925 was 16.43 inches. During the same years the average evaporation from a water surface in the six month period from April to September, inclusive, was 36.86 inches. The lowest recorded for any one season was 29.90 inches, and the highest was 44.13 inches. In certain parts of our Canadian prairies similar conditions prevail; and one can readily see that tremendous quantities of water are evaporated by hot, dry winds. An inch of rainfall over an acre represents approximately 113 tons of water. The evaporation from land, of course, is not nearly so great as from water surfaces. But it is enormous, when results are figured in tons. Crop loss due to lack of moisture can be traced largely to loss by evaporation, and not so much to lack of rainfall. Most parts of Manitoba average from 12 to 16 inches of rainfall, which, if it could be retained, would provide sufficient moisture to produce an "average crop" every year.

The problem of how to check evaporation on open areas is of tremen-

dous importance to the farmer, and should claim his attention. Numerous expedients are suggested as relief measures till such time as vegetable matter can again be incorporated into the soil.

The Problem of Drifting—When the land was first "broken," most of our soils contained considerable quantities of decayed vegetable matter. This material holds the soil particles together, and has wonderful moisture retaining properties; and crops of high yields result. As time goes on under straight growing of grain, this humus becomes exhausted, the binding power of the soil is gone, and drifting begins. The remedy is to again incorporate decaying vegetable matter into the soil. This can be aided by the growing of such fibrous-rooted plants as grasses, clovers, etc. When exhaustion of humus becomes extreme, however, great difficulty is experienced in getting grass to grow. Catches are obtained only when rainfall is sufficient and when land is summerfallowed to carry the plants over the entire season.

To get the land ready for the growing of clover, fall rye and cereals, some means must be taken to check the force of the wind. Corn or sunflowers, seeded in rows several hundred feet apart, can be used as breaks, and the area between the rows can be summerfallowed or seeded to grain crops mixed with clover.

The crops discussed in this circular are considered only because they have the capacity to withstand periods of drought and yet produce some quantity of feed for livestock.

Corn

Corn was introduced into Manitoba many years ago. Alexander Ross in 1852 mentioned the fact that the Indians each year planted a few grains of Indian Corn. In 1860 Hind, in his "Narrative of Canadian Red River Exploring Expedition of 1857," in writing of the Portage district, mentions one John Spence who had a small field of corn. This was called "Horse Teeth Corn," which was later called "Mandril," procured from the Indians at the head waters of the Missouri River, and is believed to be the parent of the Mandan variety named after the tribe of Mandan Indians.

REASONS FOR CORN GROWING IN MANITOBA

1. It will produce a large amount of fodder on a comparatively few acres.
2. Corn leaves the land in a good condition for a succeeding grain crop. Provided weeds have been destroyed, the land is equal in most respects to a carefully prepared summerfallow.
3. Corn makes an excellent soiling crop. During harvest time, when the grass is dry, corn serves a very useful purpose in supplementing pasture for all classes of stock.
4. Short growing, early maturing sorts, such as Squaw, Gehu, etc., make splendid fall pasture for hogs.
5. Corn is much easier to ensile than almost any other crop, as dangerous molds do not develop on corn so readily.
6. Animals usually prefer corn silage to silage from other crops.

ADAPTABILITY

During the earlier years of Manitoba's history, corn was grown for fodder purposes, but, due to the fact that at that time all seed was procured from the "Corn areas" in the Central States, the varieties were of late maturity and altogether unsuited to our conditions. Much of the crop was frozen before it was ready to harvest; and as a result corn was looked upon as a crop to be grown in only a few favored districts.

During recent years there has been a notable improvement in corn varieties. Much work has been done in selecting and breeding for earlier maturity, together with leaf, stem and cob production. A variety suited to most parts of our Canadian West, with the possible exception of the extreme northern areas, can now be obtained.

Success in growing corn is dependent upon :

1. The length of the growing season;
2. Use of early maturing varieties;
3. Northern grown seed.

THE CHOICE OF SEED

The average frost-free period in Manitoba is about 100 days. At Brandon the average for the past twenty-four years is 102.3 days. In selecting a corn variety for our conditions, one which will ripen within the 100 day limit should be chosen. Selection and breeding have now produced several varieties quite well suited to most parts of the Canadian West.

Considerable seed is now being grown in Manitoba and Southern Saskatchewan. North Dakota also produces large quantities of seed, as also do other States along the Canadian border. With this available supply, there is no reason why anyone should plant southern seed; and corn can now be considered a reasonably safe crop to grow.

One fact to bear in mind when selecting a variety of corn is that our comparatively early sorts, coming to maturity within the frost-free period, will produce fodder that is much higher in feeding value than the coarse, rank-growing varieties that do not mature under our conditions. Considerable work along this line has been done by T. H. Hopper (1925) at the Agricultural Experiment Station, North Dakota Agricultural College. In his bulletin, published in 1925, he proves beyond a doubt that an early maturing corn will produce more actual food value per acre than will a rank, tall, late-maturing strain.

In 1933 the writer conducted experiments with varieties commonly grown in Manitoba, and found that the late corns contained a much higher percentage of moisture. When dried weights only were taken, the early sorts weighed almost as much as the taller corn. Analysis showed that the nearer to maturity the higher was the feeding value.

VARIETIES.—Some varieties considered suitable are:

For Southern Manitoba—Falconer, Northwestern Dent (northern grown), Minnesota 13 and kindred varieties which will mature at around 100 days.

For Northern Areas—Manitoba Flint, Quebec 28, Northwestern Dent (Manitoba grown seed).

For Extreme Short Season Conditions—Squaw, Manalta, Gehu, Manitoba Flint.

PREPARATION OF SOIL

Corn is looked upon as a cleaning crop, and in this respect can be made to accomplish the destruction of weeds to a large extent, provided sufficient work is put on the soil during the growing season. Where a maximum yield from a few acres is desired, however, well prepared ground free of weeds will require much less work. Land given a heavy application of manure and then plowed in the fall, with a thorough cultivation in the spring just before planting, makes the best place to seed corn. By applying manure in this manner, it becomes mixed with the soil, and the following crop of grain is usually greatly benefitted.

SEED TESTING

Seed corn should always be tested before planting, because it is very easily injured. Count out a hundred kernels and place in a damp rag; leave in a room at the temperature of about 60°F. for about seven days, taking care that the rag is not allowed to dry. Unroll the cloth at the end of seven days and read the test. When records are kept as to the particular ears from which kernels have been taken, a pretty definite determination of those cobs which will give seed to produce strong plants can be made.

PLANTING

Time of Planting.—Numerous experiments conducted at Brandon, Winnipeg, Morden and other points all show that the earlier planting gives best results. Early varieties germinate at much lower temperatures than do the late maturing strains; therefore, they can be seeded some few days ahead of the latter. Care must be exercised, however, to see that planting is done after all danger of frost is past. The main thing to remember is that corn planted the 15th of May in areas where danger of frost is pretty well past will produce a much larger growth than if planted May 24th.

At Brandon Northwestern Dent corn gave at cutting time:—

Seeded May	5	70% mature ears	30% immature ears
Seeded May	15	57% mature ears	43% immature ears
Seeded May	25	44% mature ears	56% immature ears
Seeded June	5	14% mature ears	86% immature ears

The above table shows that the early seeding allows of a much greater percentage of mature corn.

Method of Planting—Corn can be planted quite successfully with an ordinary grain drill. The feeds are closed so that the drill will sow from thirty to thirty-six inches apart. A cardboard funnel can be tacked into the open feeds and the corn placed in the funnel. Set the drill to sow seed about four inches apart, or for about four bushels of oats per acre. In order to test out the drill, allow it to run on a hard piece of ground. In this way one can readily see if planting is being done properly. For check row planting, when a corn planter is not available, the stab planter can be used. This implement is worked by hand. The field is first checked with a wooden marker, usually horse drawn, then the hand planter is used at the intersection of the marks. These machines are very practical, and where small areas are planted save much labor. Where check row planting is desired, the only me-

thod is to use the corn planter, or for small areas the patch can be marked by hand and from four to six kernels placed in each hill. In check row planting in our province it is better to plant 36 inches apart, because our cultivating machinery is best suited to this distance apart. This, of course, will require a little more seed than is indicated above. In planting 36 inches apart there will be 4,840 hills per acre; four kernels per hill would mean 19,360 kernels per acre.

CULTIVATION

When the corn is up a few inches, a light harrow may be used to break the surface soil crust and kill annual weeds. After the corn is from four to six inches high, cultivate as often as necessary to keep down weeds and after rains to break up the hard crust formed. After the first couple of cultivations do not go too close to the plants, as the roots are very near the surface and can be very easily damaged by close, deep cultivation. It must be remembered that as the corn becomes fully grown the root system will extend pretty well across the rows, and if some of these be cut the corn will fall over during high winds. Cultivate as shallow as possible for control of weeds. Careful cultivation means increased crop returns, also less waste of moisture from the soil by evaporation. Where very dry conditions prevail, if a mulch of straw be spread between the rows after the crop is up a foot or so, a tremendous saving of moisture will take place, and a crop be produced, even though the rainfall be low.

HARVESTING

The grain binder may be used with corn of medium or short varieties. The crop should be left until as near the glazed stage as possible. Experiments have shown that corn makes the best feed when the crop is nearly ripe. Under Manitoban conditions those varieties considered medium to early should be used in order that the crop be near maturity before danger of fall frosts. The very tall, rank growing sorts, which appear to be the largest yielders, contain so much moisture and lack maturity to such an extent that when dried the dry weight is lower than that of short growing strains. The analysis of the various varieties shows that the earlier corns contain a much higher percentage of feed constituents.

For Silage—If the corn is intended for silage, it is cut and drawn direct to the cutting box and blown into the silo. However, as silos are not very numerous, and as the average grower is concerned only in having a quantity of fairly good feed, the corn crop is often stooked and dried in the field. However, the value of a silo cannot be over emphasized. Under our conditions a trench silo can be made at very little cost; and when the added feeding value is taken into consideration, the use of such a silo should be seriously considered.

Stooking—In stooking corn, a good plan is to use a sort of saw horse so that the stook may be built around it; then the horse is pulled out and carried to the next place. (For details, see drawing on page 10). After stooking, the corn is left in the field and fed as needed. If rains occur, the crop will be frozen to the ground, making it necessary to use a team of horses and a logging chain to loosen it.

Sheaf corn is very difficult to stack, because no matter how dry it may appear to be when placed in a stack, heating will very likely occur. When

the weather has turned cold and the ground is frozen, however, corn may be piled in rows like cordwood. A good plan is to place a layer of about six inches of straw, then a row of corn. In this way the straw will absorb a large quantity of the moisture in the corn.

Hogging Off—Where hogs are kept, a short growing corn, such as Gehu or Manalta, makes excellent pasturage. The cobs ripen early and are close to the ground. Some few hog raisers have an acre or so of corn, and when grain harvesting starts they turn the hogs into the growing crop and allow them to do the harvesting. All labor necessary during this period is to see that they have an ample supply of water.

WHEN SEED PRODUCTION IS THE AIM

There are a number of farmers growing corn for seed production, with splendid results. The varieties consist of Quebec No. 28, Northwestern Dent (Early), Minnesota No. 13, Gehu, Improved Squaw. The important factors to be taken into consideration are:—

1. The average period between last spring frosts and first fall frosts. If this average is around 100 days, the chances are favorable for the maturing of corn, in a fairly large proportion of the cases.
2. Constant selection from the field of the early ripened cob.
3. Selection as to type.
4. Selection for growth of stem and leaves with disease resistance, together with early maturity.

SAVING CORN FOR SEED

It is a good plan to go into the field and select only cobs which meet these requirements. In this way the seed is Manitoba grown, and has a tendency to become able to withstand our climatic conditions much better than southern grown seed. Select enough seed for two years, in order to provide for the odd year when early frosts occur. These ears are husked, and the cobs are hung up in some dry place, fairly warm and well ventilated. Racks for drying cobs can be made by driving nails into wooden stands and sticking the cobs on the nails, taking care that the cobs do not touch each other. Another good method is to nail chicken wire between two 2x4's and place the corn through the two meshes of wire. In this way a lot of corn can be stored very economically. Never put seed corn in piles, because rot will destroy the germ. *Thorough drying is the secret of good seed corn.*

Sunflowers

The common sunflower *(Helianthus annus)* is pretty well distributed over North America. It was one of the food plants of the American Indians, the seeds being eaten raw or ground into a meal for making into cakes, which were dried in the sun.

Sunflowers were grown quite extensively in Western Canada as a forage crop some years ago, but under our climatic conditions, where moisture is the limiting factor, they were found to be inferior to corn; therefore, the

acreage has decreased. Corn has the faculty of adjusting itself to periods of drought, and leaves the land with much more moisture for the succeeding crop than is left by sunflowers.

Sunflowers require a fertile soil and abundance of moisture for maximum yields. They will stand much cooler temperatures than will corn, and thus have a much longer growing season in northern latitudes, making them a useful fodder crop where corn is uncertain.

SOIL PREPARATION

The land to be seeded to sunflowers should be plowed early in the fall, if at all possible. About ten tons per acre of well rotted manure applied to the soil before plowing will exert a tremendous influence on the crop, due to the added moisture holding power of the soil. The sunflower readily utilizes large supplies of plant food, which is made available by the addition of the rotted manure. The seed bed should be prepared in the same way as for corn, by several harrowings, and, if the soil is loose, by compacting with a land packer.

SEEDING

Sunflowers are usually planted about the same time as corn; but, due to being a trifle more hardy, seeding may be a week or so earlier, usually about the time of the earliest corn planting, which will be around May 5 to 10. The ordinary grain drill can be used, by stopping the feeds and spacing the rows about 30 inches apart. The drills may have cardboard funnels placed in them, and the seed is placed directly in these funnels. This system allows of the seed being only over those runs which are intended to plant, and not distributed over the entire length of the seed box. Set the drill to sow about four bushels of oats per acre, or two bushels of wheat. The usual rate of seeding is 8 to 12 pounds per acre. Where there is ample moisture, seeding broadcast or in rows 12 inches apart will result in a crop that is much easier to handle with the ordinary binder. Seed one to two inches deep. On the other hand, in areas where it is difficult to procure sufficient forage, planting should be in drills and the land cultivated during the summer in order to keep down weeds and prevent a crust forming. When a few inches tall, the first cultivation may be made with a harrow. Care must be taken to use a very light harrow, or the crop will be seriously damaged. This will break any crust formed and will tend to kill annual weeds.

HARVESTING

There appears to be a marked difference in feeding value of sunflowers when cut at different stages of maturity. In feeding trials conducted at the University of Illinois (Bulletin No. 253), sunflowers were harvested at three stages: (1) When just headed. (2) When seed was in soft dough. (3) When fully mature. The results show that the first cutting produced a silage much superior to that from the other two cuttings. As maturity advanced the leaves dropped off and the stalks became quite woody. From the less mature plants the silage was much more palatable, and the percentage of crude fibre was much lower. While the percentage of fat increased with age, due to the maturity of the seed, the percentage of crude protein decreased. Cutting may be done with an ordinary binder if the seed has been broadcast, but when planted in rows a corn binder is almost a necessity.

USING AS SILAGE

Sunflowers should be cut with a cutting box, rather than fed whole, because the stem is not relished by stock; therefore, sunflowers should be made into silage rather than be fed as dry fodder. Sunflowers used for silage are difficult to cure; there is also a large amount of moisture which runs off and is lost. It is a good plan to mix straw or oat sheaves with the sunflowers when placing them in the silo. The moisture will be absorbed, and a much better feeding silage will be produced.

SHELTER VALUE

A few rows of sunflowers planted around the outside of a garden or seed plot makes a splendid shelter from winds. The seed contains a large percentage of fat, and is used as a poultry feed.

VARIETY

Mammoth Russian is the only variety commonly seeded in Manitoba.

Sorghums

Sorghums are annual grasses, varying in height and leafiness. They are divided into two general groups:

1. Saccharine or sweet sorghums; these have sweet, juicy stems.
2. Non-Saccharine; these include the grain sorghums; stems are not very juicy and have very little sugar.

ADAPTATION

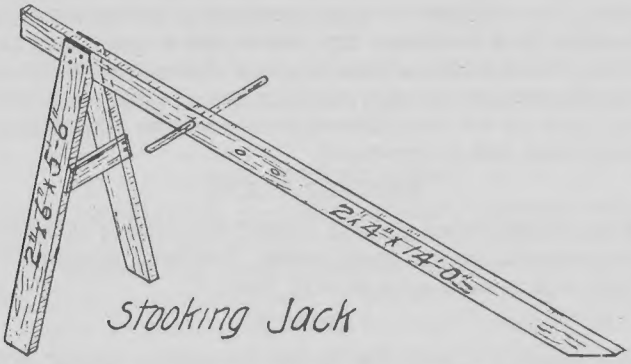
Sweet Sorghums are not suited to our conditions, but to southern "corn belt" areas. They are not resistant to drought; most are late maturing. Grain Sorghums are fairly drought resistant and adapted to arid or semi-arid regions. Sorghums are typical hot climate plants, and are very susceptible to frost.

The roots are not as extensive as on corn, and grow more shallow; they are quite fibrous, and stand long dry spells. Drought resistant sorts are not as leafy as the others. Plants of this class do better on land adapted to corn, but will produce a crop on soil too poor for corn or cereals. They are fairly resistant to alkali.

Varieties—The Amber Sorghum is the only variety worthy of considering for Manitoba.

Sudan Grass

This was introduced into the United States from the Sudan in 1909, and seeded in Chilloe, Texas; now called Sudan Grass. All animals are extremely fond of it; even the stems are readily eaten. Stems are sweet, similar to all Sorghums. This plant, being related to the Sorghums, crosses very readily with them, and several crosses are now being grown.



This is the Stooking Jack referred to in connection with stooking corn. (See page 6). The stook is started by leaning the sheaves against the long scantling and on either sides of the removable peg. When the stook is firmly established. the peg is pulled out and the jack withdrawn. If the dimensions indicated result in a jack too tall for the corn, the jack can be cut down to the right size.

A Manitoba Crop of Sudan Grass. Photo taken in September.

CHEMICAL ANALYSIS

	Protein	Fat	Crude Fibre	Nitrogen Free Extract	Ash
Sudan Grass	6.9	3.0	27.9	55.	7.2
Timothy	6.8	2.9	33.4	51.9	5.0

ADAPTATION

Sudan Grass is a plant which requires plenty of heat and moisture in order to give best results. It will, however, adapt itself to drought conditions, but with a corresponding loss of growth. In most parts of Manitoba the danger of early fall frosts makes it a rather hazardous crop to grow. In the extreme southern areas of the province, provided moisture is present in the soil, it should make a fairly good forage plant. In these parts a well prepared summerfallow would probably be the best place to plant it. In the north, with its added moisture, Sudan Grass, if seeded around June 1, would produce a large quantity of late summer feed, especially for dairy cattle; also, if cut early, it would produce a quantity of good fodder.

POISONING

There have been reports of stock being poisoned by this plant, and investigation shows that in very rare cases stock have died after eating it Like all plants of this nature, Sudan Grass has the property of storing Prussic Acid. Under very dry weather conditions the roots become quite dormant, the plant appears to wilt, and quantities of Prussic Acid are stored in the stems and leaves. As a safeguard, do not feed these plants during very hot, dry weather, or when growth appears checked. There is no danger in dry hay.

When the grass is used as pasture, hogs appear to be immune to any danger of poisoning; horses and sheep are much less susceptible than are cattle.

USES

As Pasture—There is very little available information, in so far as pasturing this plant is concerned. But it would appear to be well adapted after plants are well established, though not during very hot, dry spells.

Soiling Crops (Crops which are cut each day and fed green)—As a soiling crop this plant is well suited, because it attains maximum growth during hot weather, provided the soil contains sufficient moisture for growth. At this time of year pastures are usually dried up, and some green feed is essential. This crop can be cut daily and hauled to the stock, thus taking the place of green grass.

Silage—It is not as suitable a silage crop as corn. Due to its sugar content, molds very readily develop.

CULTURAL METHODS

As this crop is very tender, seeding should not be done till all danger of frost is past. The usual time is around the end of May. It can be drilled or broadcast, using from 15 to 40 pounds per acre. For Western Canadian conditions, 12 to 15 pounds is usually sufficient. Perhaps the best method is to seed as for corn, in drills 36 inches apart. This will require 4 to 6 pounds of seed per acre. When this is done, the drill can be arranged the same as for corn, and set to sow about 2 to 2½ pecks of wheat per acre. Seed from

one to two inches deep. Cultivation can be done as soon as plants are well above ground. A light harrow can be used at first, in order to keep a surface mulch and kill annual weeds. When the plants are from 6 to 8 inches high the cultivator should be used, and the field gone over as often as any weeds show and a crust is formed on the soil surface.

HARVESTING

Cut just when coming into full bloom. The hay becomes coarse and unpalatable after this date. The binder can be used where a corn binder is not available. Make the sheaves of medium size, and place them in small stooks. The yield should run around 2 to 4 tons of fodder per acre.

Soy Beans

The Soy Bean is an ancient plant of China and Japan. It was introduced into Northern America in the eighteenth century, but attracted very little attention until 1880—1890. It is now grown in about one dozen states in the Union.

In Canada the main areas of production are central and southwestern parts of Ontario. It has now been grown in Manitoba, especially in the Red River area, with splendid results. Due to the recency of its introduction, it should be tried in only a small way in other portions of the province.

DESCRIPTION

The soy bean is an erect, hairy annual of bushy appearance; height 1½ to 6 feet. The varieties used in this province are low growing and have to be cut with a mower.

Pods mature very close together, and there is little loss due to lack of maturity. Pods are from one-half to two and one-half inches in length; yellowish brown, covered with short bristly hair. Several hundred pods may occur on a plant.

The flowers are small, usually white or purple, borne in clusters. Although cross-fertilization sometimes occurs between varieties planted close together, the flowers are usually self-fertilized.

The leaves are tri-foliate. Some varieties retain their leaves until the plants are mature; others lose their leaves quite readily.

Soy beans have a strong tap root with numerous rootlets. Given proper conditions, with bacteria present, a plentiful supply of nodules will be produced.

VARIETIES

Varieties suited to our conditions are: Wisconsin (Black); Mandarin (Yellow). *It is not safe to use seed more than two years old.*

SOIL REQUIREMENTS

They do fairly well on soil of any type, if in a good state of fertility. Will stand drought better than corn. Very moist conditions hurt them little. An acid soil will grow a crop of soy beans.

The seed bed must be finely prepared. Plow early in the fall or as early as possible in the spring and work the land until a fine, smooth seed bed has been prepared.

SEED INOCULATION

Soy Beans are heavy gatherers of nitrogen; therefore it pays to inoculate. If this is done, they become a wonderful soil improvement crop. Soy Beans are inoculated in the same manner as are clovers. Material for inoculation can be obtained from the Bacteriological Department, University of Manitoba, Winnipeg.

SOWING

Sow when all danger of spring frost is over; about the same time as for corn. Sow the same as corn—drills 36 inches apart, at the rate of 30 pounds per acre. Plant about two inches deep.

When beans are coming through the ground, a light harrow can be used to break soil crust and check weed growth. Cultivate only as necessary to kill weeds.

HARVESTING

Soy Bean hay may be cut from the time the pods have developed, or till the leaves turn yellow. When the pods are well filled is the best time, because the highest yield and best quality of hay are produced.

Soy Beans are usually cut with a mower and left in the swath for a day or till the leaves are thoroughly wilted. They are then raked into windrows, left for two or three days, and put into small cocks. Hay should be thoroughly dry before stacking. In this province the plant is usually too short to cut with a binder; therefore the mower is usually used. Make up into small bunches and allow to dry. The stage to cut the seed is just before the pods are ripe, or in the late dough stage. If left longer than this, the entire crop may be lost by shelling.

THRESHING

Use an ordinary separator. Reduce cylinder speed to one-half, but the speed of the rest of the machine must be maintained. It is better to remove concave teeth altogether and use blanks. Small lots can be threshed by hand. Do not place beans in a large pile, because of danger of heating.

USES

Plant—Used for hay, pasture, ensilage, soiling and green manure.

Ensilage—Soy Beans alone do not make good ensilage. Stock object to bitter taste. Mixed with corn, make good silage.

Hay—Relished by stock of all classes; is equal to Alfalfa or Red Clover hay.

Pasture—Can be used for all stock.

Straw—After threshing has high feed value.

Seed Used as Feed—Due to high oil content, is a very concentrated feed.

Seed For Oil—Contains about 17.5% oil. It is now extracted on a large scale in China and Japan, also U.S.A.

For Soap, Paints, Foods, Etc.—Canada imports 5,000,000 pounds annually. One ton seed makes 250 pounds oil. The meal or cake has a feeding value equal to that of linseed oil or cotton seed cake.

Soya Bean Flour.—1 pound has same nutritive value as 2¼ pounds meat, 26 eggs, or 7½ pints of milk.

The Soy bean has been used for 5,000 years as human food. First mentioned 2838 B.C. by Emperor Shen-Ning. There is a striking contrast be-

tween the Manchurian eater of soy beans and the Chinese in South China, eaters of rice. In 1929 there were 3½ million acres seeded in U.S.A.

COMPARATIVE ANALYSIS OF PRINCIPAL FLOURS IN EVERYDAY USE

	Soy Bean	Wheat Flour	Rye Flour	Oat Flour	Corn Flour	Bean Flour	Pea Flour
Water %	9	13	13	9	13	11	11
Protein %	42	12	10	14	10	23	26
Fat %	20	1	1½	6	3	2	2
*Carbohydrate %	25	75	74	67	72	59	57
Ash %	4	½	1	2	1	3	3
Calories	470	360	356	386	363	357	356

*Carbohydrates of Soy beans contain no starch; wheat flour and rye flour contain 70% starch.

Millet

Chinese records show that millet was grown 2,700 years B.C. It is probably a native of Southern Asia. Millet was introduced into the United States about 1849 A.D. During the early years of its introduction the crop was grown in the South Central States, but gradually it extended northward into the dry areas, where it is now used as a "catch crop" during years when moisture is low. This crop has been grown in parts of Southern and Central Manitoba for some years, but never on an extensive scale. In the areas of this province where there is difficulty in providing sufficient feed for live stock, millet might well be tried.

Millets make rapid growth, provided the soil moisture is sufficient to allow the plant to function. The plant has the ability to remain almost dormant during very hot, dry weather, and revive again when moisture comes. The greater the amount of moisture, the more rapid growth and larger yields will be obtained. The plant is not as hardy as other grasses, and frost will destroy its feeding value.

USES

Russia, China and parts of Asia use considerable of the seed for human consumption. In this country, however, practically none of the grain is used. In feeding livestock it has been found that the grain has not the same feeding value as barley. If fed to cattle and hogs, the grain should be ground. For poultry, millet mixed with other grains makes a splendid feed.

Pastures.—Millet is not adapted to pasturing. The root system is rather shallow, and livestock will pull the plants up. Cropped plants do not renew growth very quickly; therefore, a large area would have to be seeded to pasture a comparatively few head of stock.

Soiling Crop.—As a "soiling crop" it will produce large quantities of green feed at the time when pastures are dried. It is relished by all classes of stock.

Forage.—Its greatest use is to provide a considerable quantity of dry fodder during the winter months in areas where the crop is light. Due to its capacity to produce growth in the warm months of June, July and August,

it can be seeded when lack of feed is apparent. By using it as a catch crop in the off-years, sufficient feed may be produced to tide the stock over the winter months.

DIGESTIBLE NUTRIENTS OF MILLET, TIMOTHY AND CLOVER

	Dry Matter	Protein	Carbohydrates	Fat
Millet	87.5	6.2	40.1	.9
Timothy	86.8	2.8	42.4	1.3
Clover	85.0	6.8	36.0	1.7

The table shows it to be higher in digestible nutrients than timothy. Digestive troubles are sometimes caused by feeding it alone. For most satisfactory results, it should be mixed with other grass or fodder plants when being fed.

The soil best adapted to millet is a rich, loose loam soil with plenty of humus. The seed bed should be carefully prepared. In areas where moisture is the limiting factor, a portion of the summerfallow should be used. It requires large amounts of moisture in a short time; therefore, the greater the amount stored in the soil, the better the crop will be.

SEEDING

Sow only when all danger of spring frosts is over and the soil is thoroughly warmed. In Manitoba about the 25th of May to the middle of June is about the proper time. The ground should be cultivated previously, in order to destroy weed growth. Seed at from 12 to 25 pounds per acre, using the ordinary grain drill. Where moisture is the limiting factor, the drills should be spaced 12 inches apart, or if desired 24 to 36 inches apart, which will permit of cultivating between rows, the same as for corn. When seeded in the latter manner, much less seed will be required.

HARVESTING

The crop should be cut for hay when headed. At this time it will have reached maximum growth, and its highest feeding value. The grain binder can be used, and the crop stooked. Allow it to become thoroughly dry before stacking, and the top of the stack should have a load of some fine grass plant to shed the rain.

VARIETIES

Varieties best suited to Manitoba are those which will mature in a comparatively short time and yet produce a large amount of fodder. The foxtail millets are to be preferred for hay purposes. They are an erect fairly tall growing type with long tapered leaves and require about 70 days to mature. The varieties most grown in Manitoba are Common, Hungarian, Golden and Hog.

Oats and Other Cereals

Oats.—The oat crop is probably grown to a greater extent for fodder than is any other annual crop. In areas where there is sufficient moisture oats produce high yields. They can withstand considerably lower temperatures than can most other crops. Ease of handling and feeding makes them

a very desirable crop. Oats are relished by all classes of stock.

When seeded for feed purposes, they can be left till around June 1st, allowing ample time to prepare the land and destroy annual weeds. Probably one of the greatest mistakes made is to leave the crop till the oats are well advanced in maturity. Experience has shown that when the kernels are in the early dough stage the best feeding value is obtained. Many wait till the oats are in late dough. At this stage the stems tend to become rather indigestible and food value is lost. It is well to remember that all cereals have attained their maximum feeding value once the kernel is formed, and from that period until maturity no plant food is being manufactured. The plant proceeds to transport the reserve food supplies that are in the stem, leaves, etc., to produce mature seed, and the texture of the plant becomes dry and woody.

Rye, Barley and Wheat.—These crops are also used in extreme cases but oats are much superior wherever they can be grown. In some portions of Manitoba cereals do not produce high yields of fodder, due to dry soil conditions. Oats require plenty of moisture and fairly cool weather for best growth. In these areas more drought resistant plants should be tried, such as corn and millets.

CONCLUSIONS

Corn, Sorghum, Millets and Soy Beans are comparatively dry land plants, and will produce fairly large returns under low soil moisture conditions, when the soil has been carefully prepared previous to planting. Under very dry conditions only summerfallowed land should be used. In the northern parts of Manitoba, where moisture is usually more plentiful, fall or spring plowed land well prepared will produce very satisfactory crops.

Millets can be utilized when dry weather conditions prevail and the state of other crops indicates shortage of winter feed for stock.

Soy Beans might well be tried in southern areas, because of their very high feeding value.

In northern areas sheaf oats offer a fairly sure supply of winter feed, but the southern areas often have difficulty in producing a good oat crop, due to very hot, dry conditions.

Annual crops appear to offer the best possibilities of a feed supply in portions of Manitoba, because perennial grasses tend to dry the soil completely.

Annual crops fit into most rotations where grain growing is the chief source of revenue.

PLEASE
Do not throw this away; if of no value to you, pass on to someone else who may be interested in the subject.